

## VITA

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#### Education

2003	Ph.D.	Exercise and Movement Science	University of Oregon – Eugene
2000	M.S.	Exercise and Sport Science	Iowa State University – Ames
1996	B.S.	Biological Science	Mesa State College, Colorado

#### Professional Experience

2005-present	Affiliate Faculty, Division of Health Sciences, Montana State University, Bozeman, MT
2004-present	Assistant Professor, Department of Health and Human Development, Montana State University, Bozeman, MT
2003-2004	Adjunct Assistant Professor, Department of Health and Human Development, Montana State University, Bozeman, MT
2000-2003	Graduate Teaching Fellow, Department of Exercise and Movement Science, University of Oregon, Eugene, OR
1999-2000	Research Engineer/Programmer, Orthopedic Biomechanics Laboratory, Mayo Clinic / Mayo Foundation, Rochester, MN

#### Professional Associations

2001-present	Member, American Society of Biomechanics
1999-present	Member, International Society of Biomechanics
1997-2000	Member, Biomedical Engineering Society

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## RESEARCH

#### Research Honors

2002	Jan Broekhoff Memorial Scholarship, University of Oregon, Eugene, OR
2002	Dissertation Matching Grant, International Society of Biomechanics

#### Refereed Journal Articles

1. Allen, J.R., O'Keefe, K.B., McCue, T.J., Borger, J.J., **Hahn, M.E.**: Upper extremity kinematic trends of fly-casting: Establishing the effects of line length. *Sports Biomechanics* 7(1): 38-53, 2008.
2. **Hahn, M.E.**: Feasibility of estimating Isokinetic knee torque using a neural network model. *Journal of Biomechanics* 40(5): 1107-1114, 2007.
3. **Hahn, M.E.**, Chou, L-S.: A model for detecting balance impairment and estimating falls risk in the elderly. *Annals of Biomedical Engineering* 33(6): 811-820, 2005.

4. **Hahn, M.E.**, Farley, A.M., Lin, V., Chou, L-S.: Neural network estimation of balance control during locomotion. *Journal of Biomechanics* 38(4): 717-724, 2005.
5. **Hahn, M.E.**, Lee, H-J., Chou, L-S.: Increased muscular challenge in older adults during obstructed gait. *Gait and Posture* 22(4): 356-361, 2005.
6. **Hahn, M.E.**, Chou, L-S.: Age-related reduction in sagittal plane center of mass motion during obstacle crossing. *Journal of Biomechanics* 37(6): 837-844, 2004.
7. Chou, L-S., Kaufman, K.R., **Hahn, M.E.**, Brey, R.H.: Medio-lateral motion of the center of mass during obstacle crossing distinguishes elderly individuals with imbalance. *Gait and Posture* 18(3): 125-133, 2003.
8. **Hahn, M.E.**, Chou, L-S.: Can motion of individual body segments identify dynamic instability in the elderly? *Clinical Biomechanics* 18(8): 737-744, 2003.
9. Sauerbier, M., Berger, R.A., Fujita, M., **Hahn, M.E.**: Radioulnar convergence after distal ulnar resection: Mechanical performance of two commonly used soft tissue stabilizing procedures. *Acta Orthopaedica Scandinavica* 74(4): 420-428, 2003.
10. Sauerbier, M., Fujita, M., **Hahn, M.E.**, Neale, P.G., An, K.-N., Berger, R.A.: Radioulnar impingement after distal ulnar resection and ulnar head hemiresection interposition arthroplasty (Bowers procedure). *Handchirurgie Mikrochirurgie Plastische Chirurgie* 35(3): 138-146, 2003. [German]
11. Park, M.J., Cooney, W.P., Berger, R.A., **Hahn, M.E.**, Looi, K.P., An, K.-N.: The effects of dorsally angulated distal radius fractures on carpal kinematics. *Journal of Hand Surgery* 27(2): 223-232, 2002.
12. Sauerbier, M., **Hahn, M.E.**, Fujita, M., Neale, P.G., Berglund, L.J., Berger, R.A.: Analysis of dynamic distal radioulnar convergence after ulnar head resection and endoprosthesis implantation. *Journal of Hand Surgery* 27(3): 425-434, 2002.
13. Sauerbier, M., **Hahn, M.E.**, Fujita, M., Neale, P.G., Germann, G., An, K.N., Berger, R.A.: Dynamic radioulnar convergence after Darrach operation, soft tissue stabilizing operations of the distal ulna and ulnar head prosthesis implantation: An experimental biomechanical study. *Unfallchirurgie* 105(8): 688-698, 2002. [German]
14. Sauerbier, M., Fujita, M., **Hahn, M.E.**, Neale, P.G., Berglund, L.J., An, K.-N., Berger, R.A.: The dynamic radioulnar convergence of the Darrach procedure and the ulnar head hemiresection interposition technique: A biomechanical study. *Journal of Hand Surgery (B&E)* 27(4): 307-316, 2002.

### **Manuscripts in Review**

1. **Hahn, M.E.**, O'Keefe, K.B.: A neural network model for estimation of joint moments during normal gait. Submitted to *IEEE Transactions on Neural Systems and Rehabilitation Engineering*.

### **International and National Peer-Reviewed Conference Abstracts**

#### **Podium Presentations:**

1. **Hahn, M.E.**, Barry, L.J., Brown, T.N., Eby, S.F., Miles, M.P.: Knee muscle coactivation during the menstrual cycle. *Proceedings of the XXI International Society of Biomechanics Congress, 2007*.
2. **Hahn, M.E.**, Chou, L-S.: Detecting balance impairment and estimating falls risk in the elderly. *Proceedings of the XXI International Society of Biomechanics Congress, 2007*.

3. **Hahn, M.E.:** Neural network estimation of isokinetic knee torque. *Proceedings of the XXth International Society of Biomechanics Congress*, 2005.
4. **Hahn, M.E.,** Chou, L-S.: A neural network model for detection of balance impairment and estimation of falls risk in the elderly. *Proceedings of the 2005 Summer Bioengineering Conference*, Vail, CO, 2005.
5. **Hahn, M.E.,** Chou, L-S.: Mapping neuromuscular inputs onto whole body dynamic stability: An artificial neural network model. *Proceedings of the XIX International Society of Biomechanics Congress*, 2003.
6. **Hahn, M.E.,** Chou, L-S.: A parameter to describe coordination of the hip and knee flexion during obstructed gait. *Conference Proceedings: IV World Congress of Biomechanics*, 2002.
7. **Hahn, M.E.,** Chou, L-S.: Hip and knee coordination during obstacle crossing. *Conference Proceedings: 7<sup>th</sup> Annual meeting of the Gait and Clinical Movement Analysis Society*, p. 56-57, 2002.
8. **Hahn, M.E.,** Looi, K.P., Park, M.J., An, K.-N.: Dynamic vs. quasi-static collection of carpal bone kinematics. *Conference Proceedings: 24<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, p. 229-230, 2000.

#### **Poster Presentations:**

1. **Hahn, M.E.,** Allen, J.R., O'Keefe, K.B.: Estimation of joint moments during gait using neural networks. *Proceedings of the 30<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, 2006.
2. Chou, L-S., Lee, H-J., **Hahn, M.E.:** Quantification of muscular challenge during obstacle crossing in elderly: EMG vs. Joint moment. *Conference Proceedings: 28<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, 2004.
3. **Hahn, M.E.,** Lee, H-J., Chou, L-S.: Dynamic stability maintained in elderly with conservative antero-posterior strategy. *Proceedings of the XIX International Society of Biomechanics Congress*, 2003.
4. **Hahn, M.E.,** Lee, H-J., Koshida, S., Chou, L-S.: Neuromuscular challenge in the elderly during locomotion: An EMG study. *Proceedings of the XIX International Society of Biomechanics Congress*, 2003.
5. Mandeville, D., Osternig, L., Chou, L., **Hahn, M.,** Chen, S.: Stance phase moment patterns pre and post total knee replacement. *Conference Proceedings: 27<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, 2003.
6. **Hahn, M.E.,** Chou, L-S.: Subtle effect of walking speed on medio-lateral center of mass in young adults. *Conference Proceedings: IV World Congress of Biomechanics*, 2002.
7. **Hahn, M.E.,** Chou, L-S., Kaufman, K.R. and Brey, R.H.: Foot elevation and whole body medial-lateral sway in elderly patients with balance disorders. *Conference Proceedings: 25<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, p. 241-242, 2001.
8. **Hahn, M.E.,** Chou, L-S., Kaufman, K.R. and Brey, R.H.: Can trajectories of individual bony landmarks indicate medial-lateral instability during obstacle crossing? *Conference Proceedings: 25<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, p. 251-252, 2001.
9. **Hahn, M.E.,** Pinckney, D.T., Gregg, M.T., Derrick, T.R.: Wheelchair mobility using shock-absorbing front casters. *Proceedings of the XVI International Society of Biomechanics Congress*, p. 949, 1999.

10. **Hahn, M.E.**, McLean, S.P., Derrick, T.R., Allyn, D.A. Effect of bench height on resultant joint moments in older adults performing a sit-to-stand task. *Proceedings of the 3rd North American Congress on Biomechanics*, p. 7, 1998.
11. Holthe, M., Baker, A., **Hahn, M.**, Gregg, M., Pinckney, D., Fox, A., Devries, S., Derrick, T., McLean, S.: Energy absorption characteristics of different volleyball court surfaces. *Proceedings of the 3<sup>rd</sup> North American Congress on Biomechanics*, p. 429, 1998.
12. McLean, S P., **Hahn, M.E.**, Vint, P.F., Holthe, M.J.: Restricted step length in vertical jumping. *Medicine and Science in Sports and Exercise*, 30(55): 154, 1998.

### Book Chapters

1. **Hahn, M.E.**, Farley, A.M., Chou, L-S.: Neural network models for estimation of balance control, detection of imbalance, and estimation of falls risk. In: *Computational Intelligence for Movement Sciences: Neural Networks, Support Vector Machines and other Emerging Techniques* (eds. R.K. Begg and M. Palaniswami). Publisher: Idea Group, Inc., Hershey, PA. 2006. pp. 217-242.

### Invited Research Presentations

1. **Hahn, M.E.**: Developing a Surrogate Model of Joint Kinetics During Gait. Presented to the University of Montana, School of Physical Therapy and Rehabilitation Sciences. November 6<sup>th</sup>, 2007.
2. **Hahn, M.E.**: Mechanics of Human Gait: Using Machine Learning to Develop Surrogate Models of Joint Kinetics. Presented to the Cell and Neurobiology Departmental Seminar, Montana State University, Bozeman, MT. October 19<sup>th</sup>, 2007.
3. **Hahn, M.E.**: Effects of Dynamic Wheelchair Seating on Spasticity and Functional Mobility in Children: Project Report. Presented at the MedTrade Fall Convention, Orlando, FL. October 2-3, 2007.
4. **Hahn, M.E.**: Distance Delivered Gait Analysis: Using Machine Learning to Develop Surrogate Models of Joint Kinetics. Presented to the Orthopedic Research Seminar, Mayo Clinic, Rochester, MN. April 25<sup>th</sup>, 2007.
5. **Hahn, M.E.**: Initial Findings from a Biomechanical Analysis of Fly-Casting. Presented to the American Medical Fly-Fishing Association, annual meeting. West Yellowstone, MT. August, 29<sup>th</sup>, 2005.
6. **Hahn, M.E.**: Mapping Neuromuscular Activation onto Isokinetic Joint Torque. Presented to the 2004 Montana BRIN Summer Faculty Institute. Red Lodge, MT. June, 2004.

### External Research Support and Grants

#### **Funded and completed:**

- 2006-2007     **Hahn, M.E.** (PI). Effects of Dynamic Wheelchair Seating on Spasticity and Functional Mobility in Children. Thrasher Research Fund, grant number 02822-7, \$88,403. April 2006 – September 2007.
- 2005            **Hahn, M.E.** (PI). Using Machine Learning to Estimate Joint Moments. NIH grant number P20 RR0164 55-04 from the INBRE program of the National Center for Research Resources, \$20,000. March 2005 – June 2005.

- 2004 **Hahn, M.E.** (PI). Mapping Neuromuscular Activation onto Isokinetic Joint Torque: Development of an Artificial Neural Network Model. NIH grant number P20 RR0164 55-01 from the BRIN program of the National Center for Research Resources, \$25,000. March 2004 – June 2004.

#### **Internal Grants to Enhance Research**

- 2006-2007 **Hahn, M.E.** (PI). Montana State University, Clinical Research Development Program, for grant-smith mentoring and preparation of NIH R01 proposal, \$9,380. August 2006 – June 2007.
- 2006 **Hahn, M.E.** (PI), Miles, M.P. The Effects of Sex Hormones on Knee Joint Laxity, Proprioception and Musculoskeletal Dynamics. Department of HHD Mini-grant, \$6,020. January 2006 - December 2006.
- 2004 College of Education, Health and Human Development Mini-grant, for collection and analysis of pilot data to support application for NIH R03 proposal, \$3,000. May 2004 – August 2004.

#### **Presentations and Published Abstracts by Students Under My Direction**

##### **Podium presentations:**

1. O’Keefe, K.B., **Hahn, M.E.**: Using an artificial neural network to predict joint moments for patients with osteoarthritis. *Presented at the 3<sup>rd</sup> Annual Northwest Biomechanics Symposium*. Eugene, OR, 2007.
2. Killian, M.L., Nagashima, C.I., **Hahn, M.E.**: The effect of downhill running on impact shock and asymmetry. *Presented at the 2<sup>nd</sup> Annual Northwest Biomechanics Symposium*. Vancouver, BC, 2006.
3. O’Keefe, K.B., **Hahn, M.E.**: Comparison of validation techniques for neural network estimation of joint moments during gait. *Presented at the 2<sup>nd</sup> Annual Northwest Biomechanics Symposium*. Vancouver, BC, 2006.
4. Allen, J.R., O’Keefe, K.B., McCue, T.J., **Hahn, M.E.**: Upper extremity kinematics during fly-casting. *Presented at the 1<sup>st</sup> Annual Northwest Biomechanics Symposium*. Seattle, WA, 2005.
5. O’Keefe, K.B., Allen, J.R., McCue, T.J., **Hahn, M.E.**: Joint velocity sequence of the upper extremity during fly-casting. *Presented at the 1<sup>st</sup> Annual Northwest Biomechanics Symposium*. Seattle, WA, 2005.

##### **Poster presentations:**

1. Eby, S., Hutchison, K., **Hahn, M.**: The effect of dual attention tasks on cognitive and motor function. *Presented at the 3<sup>rd</sup> Annual Northwest Biomechanics Symposium*. Eugene, OR, 2007.
2. Allen, J.R., **Hahn, M.E.**: Casting for distance: Effects of line length on kinematics of fly-casting. *Proceedings of the 30<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, 2006.
3. Killian, M.L., Nagashima, C.I., **Hahn, M.E.**: The effect of downhill running on impact shock and asymmetry. *Proceedings of the 30<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, 2006.

4. O'Keefe, K.B., **Hahn, M.E.**: Comparison of validation techniques for neural network estimation of joint moments during gait. *Proceedings of the 30<sup>th</sup> Annual Meeting of the American Society of Biomechanics*, 2006.
5. Allen, J.R., O'Keefe, K.B., McCue, T.J., **Hahn, M.E.**: Upper extremity kinematics during fly-casting. *Proceedings of the XXth International Society of Biomechanics Congress*, 2005.
6. O'Keefe, K.B., Allen, J.R., McCue, T.J., **Hahn, M.E.**: Joint velocity sequence of the upper extremity during fly-casting. *Proceedings of the XXth International Society of Biomechanics Congress*, 2005.
7. Brown, T., **Hahn, M.E.**: The EMG/torque relationship of the knee extensors during acute fatigue. *Proceedings of the XXth International Society of Biomechanics Congress*, 2005.

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## **TEACHING**

### **Teaching Honors**

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|------|---|
| 2007 | <i>Recipient</i> : Outstanding Teacher Award, College of Education, Health and Human Development, Montana State University, Bozeman, MT |
| 2007 | <i>Faculty Mentor</i> : Award for Excellence, Alumni Association, Montana State University, Bozeman, MT                                 |
| 2007 | <i>Recipient</i> : Influential Educator, College of Education, Health and Human Development, Montana State University, Bozeman, MT      |
| 2006 | <i>Faculty Mentor</i> : Award for Excellence, Alumni Association, Montana State University, Bozeman, MT                                 |
| 2006 | <i>Recipient</i> : Influential Educator, College of Education, Health and Human Development, Montana State University, Bozeman, MT      |
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### **Courses Developed and Taught**

#### **University of Oregon:**

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| 2000-2002 | Biomechanics (EMS 381); 3 credit lecture, 1 credit lab                  |
| 2001-2002 | Orthopedic Biomechanics (EMS 410/510); 3 credit lecture                 |
| 2001-2002 | Upper Extremity Biomechanics (EMS 410/510); 3 credit lecture            |
| 2001-2002 | Lower Extremity Biomechanics (EMS 410/510); 3 credit lecture            |
| 2003      | Quantitative Analysis of Human Movement (EMS 410/510); 3 credit lecture |

#### **Montana State University:**

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| 2003-present | Anatomical Kinesiology (HDPE 320); 3 credit lecture, 1 credit laboratory |
| 2004-present | Biomechanics (HDPE 323); 3 credit lecture, 1 credit laboratory           |
| 2004-present | Biomechanical Analysis of Human Movement (HDPE 540); 3 credit lecture    |
| 2005-present | Instrumentation in Biomechanics (HDPE 541); 3 credit lecture             |

#### **Graduate Advising – Chair**

- Jacob Gardner: No thesis topic yet.  
 Kelsey Cooley: No thesis topic yet.  
 Sara Frederickson: No thesis topic yet.  
 Morgan Goode: No thesis topic yet.  
 Gaurav Kaushik: No thesis topic yet.

Kathryn B. O'Keefe: *Joint moment estimation from electromyography of osteoarthritis patients during gait using an artificial neural network*. Thesis completed in October, 2007.  
 Megan L. Killian: *The effect of downhill running on impact shock and asymmetry*. Thesis completed in April, 2007.  
 Joshua R. Allen: *Upper extremity kinematics and joint coordination of fly-casting*. Thesis completed in May, 2006.  
 Tyler N. Brown: *The effects of acute muscular fatigue on the functional ability of the knee joint*. Thesis completed in November, 2005.

**Undergraduate Honor's Theses**

Sarah F. Eby: *Evaluation of Neuromuscular Activation in the Wrist During Isometric Contractions Post Distal Radius Fracture*. Thesis proposed October, 2007.

**Undergraduate Advising**

2004-present	Curriculum and professional development advising for pre-physical therapy students (~60 students per semester)
2004-present	Advisor of pre-physical therapy internships (~10 students per semester, including summers)
2004-present	Advise undergraduate research projects for HHD students as well as students from Mechanical Engineering (2-3 students per semester)

**Internal Grants to Enhance Teaching**

2005	Computer Fee Allocation	\$2,500
2004	Computer Fee Allocation	\$5,500

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**SERVICE**

**Invited Service/Outreach Presentations**

1. **Hahn, M.E.:** Dynamic Balance Control and Prevention of Falls. Presented to Aspen Pointe and HillCrest Retirement Center. Bozeman, MT. June 8<sup>th</sup>, 2005.

**Ad hoc Peer-Review**

*Archives of Physical Medicine and Rehabilitation*  
*Gait and Posture*  
*IEEE Transactions on Neural Systems and Rehabilitation Engineering*  
*Intermountain Journal of Science*  
*Journal of Applied Biomechanics*  
*Journal of Biomechanics*  
*Journal of Rehabilitation Medicine*  
*Medical Engineering and Physics*  
*Research Quarterly in Exercise and Sport*  
*Sports Biomechanics*  
 Grant Referee, U.S. Civilian Research and Development Foundation, Science Centers Program  
 Chapter Referee, *Computational Intelligence for Movement Sciences* (eds. Begg and Palaniswami)

Chapter Referee, *Encyclopedia of Biomedical Engineering; Biomechanics Section*  
(eds. Chou and Karduna)

**Scientific Symposia Service**

2008 *Program Chair*, Annual Northwest Biomechanics Symposium, Boise, ID  
2007 *Session Chair*, Gait and Balance 1 –International Society of Biomechanics  
XXIth Congress, Taipei, Taiwan  
2007 *Member*, Scientific Review Committee – Annual Northwest Biomechanics  
Symposium, Eugene, OR  
2006 *Member*, Awards Committee – Annual Northwest Biomechanics  
Symposium, Vancouver, BC  
2005 *Member*, Scientific Review Committee – Annual Northwest Biomechanics  
Symposium, Seattle, WA  
2005-present *Member*, Advisory Committee – Northwest Biomechanics Symposium

**University Committees**

2007 Chair, Health and Human Performance Faculty Search Committee  
2006-2007 Chair, Department Budget Committee  
2006-present Member, Department Computer and Equipment Committee  
2005-2006 Member, Department Budget Committee  
2005-2006 Member, Department Research Committee  
2004 Member, Department Merit Standards Review Committee  
2004 Member, Department Search Committee for grant-funded lab technician